

REMARKS

Reconsideration and allowance of the above-identified Application in view of the above amendments and the following remarks are respectfully requested.

Claims 1-22 are pending in the Application. New claim 22 is added herein. Support for claim 22 may be found throughout the initial disclosure.

Claim rejections – 35 USC § 102

Claims 1-7 and 11-18 were rejected under 35 U.S.C. § 102(b) as being anticipated by Stoeldraijer et al. (U.S. Patent No. 6,753,508). Applicants respectfully traverse this rejection for at least the following reasons.

Stoeldraijer et al. discloses a lithography apparatus with filters (correction device) for optimizing uniformity of an image. The filters are disposed in the path of the projection beam supplied by a radiation system to vary the spatial intensity of the beam in a direction of its cross-section so that the intensity at a substrate level is uniform across substantially the entire length of the cross-section.

Stoeldraijer et al. does not disclose, teach or suggest a first illumination system for providing a projection beam of radiation and a second illumination system for providing a compensating beam of radiation to a predetermined area on a substrate in which an intensity of the compensating beam is varied across the predetermined area, as claimed in claim 1. Stoeldraijer et al. does not disclose, teach or suggest projecting a patterned beam of radiation onto a target portion of a substrate, wherein before the patterned beam of radiation is projected on to the target portion of the substrate, a beam of compensating radiation is irradiated on to a predetermined area of the substrate, the beam of compensating radiation having an intensity which varies across said predetermined area, as claimed in claim 11.

In Stoeldraijer et al., it is the spatial intensity across the projection beam that is varied or adjusted by using an appropriate filter. Stoeldraijer et al. does not use a second illumination system to provide a compensating beam of radiation in which an intensity of the compensating beam is varied across the predetermined area of the substrate. Stoeldraijer et al. does not disclose, teach or suggest a beam of compensating radiation is irradiated on to a predetermined area of the substrate before the patterned beam of radiation is projected onto a target portion of the substrate.

Contrary to the Examiner's contention, the first illumination system is not provided using the first filter and the second illumination is not provided using the second filter. The first and the second filters are components of the correction device and are used in combination (or together) and disposed in the path of the projection beam supplied by a radiation system, i.e., an illumination system, to vary the spatial intensity of the projection beam in a direction of its cross-section so that the intensity at the substrate level is uniform across substantially the entire length of the cross-section. Consequently, Stoeldraijer et al. does not disclose, teach or suggest the subject matter recited in independent claims 1 and 11.

With regard to claim 27 which depends from claim 1 and claims 12-18 which depend from claim 11, contrary to the Examiner's contention Stoeldraijer et al. digital filter does not have "each or all" the characteristics recited in these claims. Claim 7 recites, *inter-alia*, "the substrate table is formed and arranged to rotate the substrate during exposure with the compensating beam so that an annular area of the substrate is exposed with the compensating beam," and claim 18 recites, *inter-alia*, "rotating the substrate during irradiation with the compensating beam so that an annular edge region of the substrate is irradiated with the compensating beam." Clearly, Stoeldraijer et al. does not disclose, teach or suggest that the substrate table can be rotated during irradiation with the compensating beam. In fact, the Examiner concedes, in section 8, page 6 of the Office Action, that Stoeldraijer et al. does not disclose or suggest the substrate table is formed and arranged to rotate the substrate during irradiation with the compensating beam. Therefore, the rejection of claims 7 and 18 under § 102(b) over Stroeldraijer et al. is improper.

Therefore, Applicants respectfully submit that claims 1 and 11, and claims 2-7 and 12-18 which depend directly or indirectly from either claim 1 or claim 11, are patentable. Thus, Applicants respectfully request that the rejection of claims 1-7 and 11-18 under § 102(b) over Stoeldraijer et al. be withdrawn.

Claims 1, 3, 7, 11, 16 and 18 were rejected under 35 U.S.C. § 102(a) and (e) as being anticipated by Kim et al. (U.S. Patent Application Publication No. 2004/0214094). Applicants respectfully traverse this rejection for at least the following reasons.

Kim et al. does not disclose, teach or suggest a first illumination system for providing a projection beam of radiation and a second illumination system for providing a compensating beam of radiation to a predetermined area on a substrate in which an intensity of the compensating beam is varied across the predetermined area, as claimed in claim 1.

Kim et al. does not disclose, teach or suggest projecting a patterned beam of radiation onto a target portion of a substrate, wherein before the patterned beam of radiation is projected on to the target portion of the substrate, a beam of compensating radiation is irradiated on to a predetermined area of the substrate, the beam of compensating radiation having an intensity which varies across said predetermined area, as claimed in claim 11.

Kim et al. merely discloses photomasks including shadowing elements. The shadowing elements are used in the photomask to compensate for variation in intensity of the patterning radiation propagating through a pattern in the photomask. According to Kim et al. effects of diffraction through a radiation blocking pattern and effects of varying transmittance through different portions of an array of shadowing elements may be offset so that an approximately uniform intensity of patterning radiation is transmitted the substrate of the photomask and the radiation blocking pattern (see lines 8-14 in paragraph [0035] in Kim et al.).

In Kim et al. the first and second illumination conditions do not correspond to, respectively, the first illumination system for providing a projection beam of radiation and the second illumination system for providing a compensating beam of radiation, recited in claim 1. The first and second illumination conditions discussed in Kim et al. merely correspond to, respectively, the condition of the illumination beam when the illumination beam is propagated through a first array of shadowing elements and when the illumination beam is propagated through a second array of shadowing elements (see paragraphs [0011] and [0012] in Kim et al.).

In addition, contrary to the Examiner's contention, the first illumination system does not provide a compensating beam of radiation to predetermined areas of the substrate. It is the second illumination system that provides a compensating beam of radiation to a predetermined area of the substrate, as recited in claim 1. The Examiner directs Applicants to paragraphs 34 and 35 in Kim et al. and contends that Kim et al. discloses "a first and a second illumination systems for providing a compensating beam of radiation to predetermined areas of the substrate, the intensity of the compensating beam being substantially varied across the predetermined area." Applicants respectfully disagree.

In paragraphs 0034 and 0035, Kim et al. merely discusses that arrays of shadowing elements 105 may be arranged so that a density of the shadowing elements is greater in a central portion of the substrate and so that a density of the shadowing elements decreases as a distance from the center of the substrate increases and thus the transmittance through the

arrays 105 may be greatest near the edges of the substrate of the photomask and the transmittance through the arrays may be the least near the center of the substrate of the photomask. Because diffraction of the patterning radiation passing through the radiation blocking pattern 103 may result in greater attenuation of patterning radiation at edges of the photomask, effects of varying transmittance through different portions of the array of shadowing elements 105 and effects of diffraction through the radiation blocking pattern 103 may be offset so that an approximately uniform intensity of patterning radiation is transmitted through the substrate 101, i.e. the substrate of the photomask.

Kim et al. merely uses arrays of shadowing element to correct the profile of the projection beam at the patterning device (photomask) level so that an approximately uniform intensity of patterning radiation is transmitted through the patterning device. Clearly, Kim et al. does not disclose, teach or suggest that a first illumination system for providing a projection beam of radiation and a second illumination system for providing a compensating beam of radiation to a predetermined area of the substrate, an intensity of the compensating beam being varied across the predetermined area, as recited in claim 1. Furthermore, Kim et al. does not disclose, teach or suggest projecting the patterned beam of radiation onto a target portion of a substrate, wherein before the patterned beam of radiation is projected on to the target portion of the substrate, a beam of compensating radiation is irradiated on to a predetermined area of the substrate, the beam of compensating radiation having an intensity which varies across said predetermined area, as recited in claim 11. Consequently, Kim et al. does not disclose, teach or suggest the subject matter recited in independent claims 1 and 11.

Therefore, Applicants respectfully submit that claims 1 and 11, and claims 3, 7, 16 and 18 which depend directly or indirectly from either claim 1 or claim 11, are patentable. Thus, Applicants respectfully request that the rejection of claims 1, 3, 7, 11, 16 and 18 under § 102(a) and (e) over Kim et al. be withdrawn.

Claim rejections – 35 USC § 103

Claims 8 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Stoeldraijer et al. or Kim et al. Applicants respectfully traverse this rejection for at least the following reasons.

Claims 8 and 9 depend from claim 1. Therefore, for at least the reasons provided above with respect to claim 1, Applicants respectfully submit that claims 8 and 9 are

patentable over Stoeldraijer et al. and Kim et al. In addition claims 8 and 9 are further patentable for the subject matter recited therein.

The Examiner contends that it would have been an obvious matter of choice to use a second substrate table for holding the substrate during a second exposure since Applicant has not disclosed that using such a second substrate table would solve any stated problem or has any particular purpose. Applicants respectfully disagree.

By providing a second substrate table for holding the substrate during exposure of the predetermined area of the substrate with the beam of compensating radiation, as recited in claim 8, it is possible, for example, to carry out the exposure of the predetermined area of the substrate on the second substrate table while simultaneously exposing another substrate (which was already exposed to the compensating radiation) to the patterned projection beam. In this way, for example, the throughput of the lithographic apparatus may be increased. Consequently, Applicants respectfully submit that claims 8 and 9 are further patentable for the subject matter recited therein.

Therefore, Applicants respectfully submit that claims 8 and 9 are patentable, and respectfully request that the rejection of claims 8 and 9 under § 103 (a) over either Stoeldraijer et al. or Kim et al. be withdrawn.

Claims 20 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kim et al. Applicants respectfully traverse this rejection for at least the following reasons.

Claims 20 and 21 depend from, respectively, claims 1 and 11. Therefore, for at least the reasons provided above with respect to claims 1 and 11, Applicants respectfully submit that claims 20 and 21 are patentable over Kim et al. Thus, Applicants respectfully request that the rejection of claims 20 and 21 under § 103 (a) over Kim et al. be withdrawn.

Claims 7 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Stoeldraijer et al. or Kim et al. in view of Kinney et al. (U.S. Patent No. 6,809,809). Applicants respectfully traverse this rejection for at least the following reasons.

Claims 7 and 18 depend from, respectively, claim 1 and claim 11. Therefore, for at least the reasons provided above with respect to claims 1 and 11, Applicants respectfully submit that claims 7 and 18 are patentable over Stoeldraijer et al. and Kim et al. In addition, claims 7 and 18 are further patentable over Stoeldraijer et al. and Kim et al. for the subject matter recited therein.

Kinney et al. does not overcome the deficiencies noted above in Stoeldraijer et al. and Kim et al. Kinney et al. merely discloses an optical inspection module used for detecting defects on a substrate. Kinney et al. does not disclose, teach or suggest the subject matter recited in claims 1 and 11. Furthermore, Kinney et al. merely rotates the substrate so as to collect images at each substrate position to enhance the ability of the inspection module to detect light scattered from particles or other defects on the substrate surface. Kinney et al. does not rotate the substrate so that an annular area of the substrate is exposed. Therefore, one would not have been motivated to combine Kinney et al. with either Stoeldraijer et al. or Kim et al. Consequently, for this additional reason, Applicants respectfully submit that none of, Stoeldraijer et al., Kim et al. and Kinney et al, alone or in combination, disclose, teach or suggestion the subject matter recited in claims 7 and 18.

Therefore, Applicants respectfully submit that claims 7 and 18 are patentable, and respectfully request that the rejection of claims 7 and 18 under § 103(a) over either the combination of Stoeldraijer et al. and Kinney et al. or the combination of Kim et al. and Kinney et al. be withdrawn.

Claims 10 and 19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Stoeldraijer et al. or Kim et al. in view of Lee et al. (U.S. Patent No. 6,534,221). Applicants respectfully traverse this rejection for at least the following reasons.

Claims 10 and 19 depend from, respectively, claim 1 and claim 11. Therefore, for at least the reasons provided above with respect to claims 1 and 11, Applicants respectfully submit that claims 10 and 19 are patentable over Stoeldraijer et al. and Kim et al. In addition, claims 10 and 19 are further patentable over Stoeldraijer et al. and Kim et al. for the subject matter recited therein.

Lee et al. does not overcome the deficiencies noted above in Stoeldraijer et al. and Kim et al. Lee et al. merely discloses a method for fabricating a mask for patterning a radiation sensitive layer. Furthermore, contrary to the Examiner's contention, the "OEBR" disclosed in col. 7, line 31 in Lee et al. is not an Optical Edge Bead Removal system but "Olin OEBR 514" is simply a trademark of a photoresist material. Therefore, Lee et al. does not disclose, teach or suggest the subject matter recited in claims 10 and 19. Consequently, for this additional reason, Applicants respectfully submit that none of, Stoeldraijer et al., Kim et al. and et Lee al., alone or in combination, disclose, teach or suggestion the subject matter recited in claims 10 and 19.

Therefore, Applicants respectfully submit that claims 10 and 19 are patentable, and respectfully request that the rejection of claims 10 and 19 under § 103(a) over either the combination of Stoeldraijer et al. and Lee et al. or the combination of Kim et al. and Lee et al. be withdrawn.

Claim 22 has been added. Claim 22 depends from claim 1. Therefore, for at least the reasons provided above with respect to claim 1, Applicants respectfully submit that claim 22 is patentable. Furthermore, claim 22 is patentable for the subject matter recited therein. None of the relied upon references, disclose, teach or suggest, alone or in combination, *inter-alia*, “a latent image formed on the substrate by the projection beam is superposed to a latent image formed on the substrate by the compensating beam to form an image on the substrate in which critical dimension non-uniformities are substantially reduced.”

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,
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